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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
HL73026/001/mja		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/GB00/03171	16/08/2000	16/08/1999
International Patent Classification (IPC) or national classification and IPC G06K19/06		
Applicant FLYING NULL LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☒ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
21/02/2001	28.06.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Harms, J Telephone No. +49 89 2399 2708

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/03171

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
Description, pages:

1-14 as originally filed

Claims, No.:

1-23 as amended under Article 19

Drawings, sheets:

1/1 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-23
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-23
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-23
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

Re.: Item V

The invention concerns an information carrier (claims 1 and 2) and an information coding method (claims 18 and 19), in particular the way in which the elements encoding the information are arranged on a substrate. Closest prior art is US-A-5 552 591 according to which the spaces between single-width bar code elements constitute integer multiples of a minimum space width. According to the claimed invention the spaces between the elements can be represented by A + mG, wherein m is an integer and A and G are mutually different fixed values. This is not suggested by the prior art and makes it possible individually to select the minimum separation (A) between two elements as eg. required by the reading method, and the gap increments (mG), so that greater density of data can be carried on a given information carrier size.

Dependent claims 3-17 and 20-23 concern preferred embodiments of the apparatuses or methods of claims 1, 2, 18 and 19 and therefore likewise meet the requirements of novelty and inventive step.

Re.: Item VII

The adopted two-part form of the independent claims is incorrect; as an example, all the features contained in numbered lines 3-12 of claim 1 are known, in combination, from US-A-5 552 591 and would hence belong in the preamble of the claim, Rule 6.3(b) PCT.

The summary of the invention on description pages 2-4 is not in conformity with the amended set of claims, Article 6 PCT and Rule 5.1(a)(iii) PCT.

US-A-5 552 591 is not acknowledged in the description, contrary to Rule 5.1 (a)(ii) PCT.

CLAIMS:

1. An information carrier comprising a plurality of individual detectable elements supported by, or incorporated in, a substrate wherein the spacing between the elements serves to encode the information and is such that it can be represented as A + mG, wherein A is a first fixed value, m is an integer (which may be zero) and G is a second fixed value, characterised in that the values of the integer m, are selected to be integers derived by a predetermined mathematical sequence.

2. An information carrier comprising a plurality of individual detectable elements supported by, or incorporated in, a substrate wherein the spacing between the elements serves to encode the information and is such that it can be represented as A + mG, wherein A is a first fixed value, m is an integer (which may be zero) and G is a second fixed value, characterised in that the values of the integer m, are selected to be integers derived by a means of a random number generator.

3. An information carrier as claimed in claim 1, wherein the values of the integer m are selected to be integers derived by a de Bruijn sequence.

4. An information carrier as claimed in claim 1 or 3, wherein the integers m are chosen by way of a sequence generator.

5. An information carrier as claimed in any preceding claim, wherein said fixed values A and G are units of length.

6. An information carrier as claimed in any

preceding claim, wherein said fixed values A and G are angles.

7. An information carrier as claimed in any preceding claim, wherein the spacing between adjacent detectable elements is measured from the midpoint of one element to the midpoint of the adjacent element.

8. An information carrier as claimed in any preceding claim, wherein said detectable elements are magnetically active elements.

9. An information carrier as claimed in claim 8, wherein said magnetically active detectable elements comprise high permeability, low coercivity material having an easy axis of magnetisation.

10. An information carrier as claimed in any preceding claim, wherein said detectable elements are formed of an optically detectable material.

11. An information carrier as claimed in claim 8 or 9 wherein said the magnetic properties of each of the magnetic elements serves to encode the information carrier.

12. An information carrier as claimed in any preceding claim, wherein the geometric properties of the elements is varied such that the relative dimensions of the elements also serves to encode information .

13. An information carrier as claimed in claim 11 or 12 wherein the magnetic or geometric properties of at least one of the elements is or are known, thereby acting as a reference element with respect to the

magnetic or geometric properties of the other detectable elements.

14. An information carrier as claimed in any one of claims 11, 12 or 13, wherein the length of the magnetic elements is varied such that the relative lengths of said magnetic elements also serves to encode information.

15. An information carrier as claimed in any preceding claim, wherein said mathematical sequence is a recurring sequence.

16. An information carrier as claimed in any preceding claim, wherein said substrate comprises a linear strip.

17. An information carrier as claimed in any preceding claim, wherein the encoded information is determined by detecting the spacing between adjacent elements when considered in turn along a predetermined path.

18. An information carrier as claimed in claim 17, wherein the values of m are chosen such that the sequence of spacings between adjacent elements, when considered in turn along said predetermined path in a first direction, is identical to the sequence of spacings between adjacent elements when considered in turn along a path in a second direction which is opposite to said first direction.

19. An information carrier as claimed in claim 18, wherein the spacing between the elements is such that direction of the predetermined path can be determined.

20. An information coding method utilising a plurality of detectable elements supported by, or incorporated in, a substrate, wherein said elements are spaced apart from one another such that the spacing between the elements serves to encode the information and is such that it can be represented as A + mG, wherein A is a first fixed value, m is an integer (which may be zero) and G is a second fixed value, characterised in that the values of the integer m, are selected to be integers derived by a predetermined mathematical sequence.

21. An information coding method utilising a plurality of detectable elements supported by, or incorporated in, a substrate, wherein said elements are spaced apart from one another such that the spacing between the elements serves to encode the information and is such that it can be represented as A + mG, wherein A is a first fixed value, m is an integer (which may be zero) and G is a second fixed value, characterised in that the values of the integer m, are selected to be integers derived by means of a random number generator.

22. An information coding method as claimed in claim 20 or 21, wherein the method utilises an information carrier as claimed in any one of claims 3 to 19.

23. An information coding method as claimed in any one of claims 20, 21 or 22, wherein the code is read by detecting the spacing between each pair of adjacent elements and expressing the spacings as a sequence which maintains the order of spacings on the tag, but commences with the spacing of greatest magnitude, and wherein if there are two or more spacings equal to the

greatest magnitude, the starting value of the sequence is selected such that the sequence, if read as a number, would have the highest possible value.

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AMENDED CLAIMS

[received by the International Bureau on 16 January 2001 (16.01.01);
original claims 1, 2, 13 and 17-23 replaced by new claims 1, 2, 13 and 17-23;
remaining claims unchanged (5 pages)]

1. An information carrier comprising a plurality of detectable elements supported by, or incorporated in a substrate, the elements being spaced apart from one another such that the series of spaces between the elements encodes the information carrier, characterised in that each of the spaces can be represented by A + mG, wherein A is a first fixed value, G is a second fixed value and m is an integer (which may be zero) the values of which are derived from the integers of a predetermined mathematical sequence, and wherein the value of A is different to the value of G.

2. An information carrier comprising a plurality of detectable elements supported by, or incorporated in a substrate, the elements being spaced apart from one another such that the series of spaces between the elements encodes the information carrier, characterised in that each of the spaces can be represented by A + mG, wherein A is a first fixed value, G is a second fixed value and m is an integer (which may be zero) the values of which are derived by means of a random number generator, and wherein the value of A is different to the value of G.

3. An information carrier as claimed in claim 1, wherein the values of the integer m are selected to be integers derived from the output of a de Bruijn sequence.

4. An information carrier as claimed in claim 1 or 3, wherein the integers m are selected to be integers derived from the output of a binary pseudo-random sequence generator.

5. An information carrier as claimed in any preceding claim, wherein said fixed values A and G are units of length.

6. An information carrier as claimed in any preceding claim, wherein said fixed values A and G are angles.

7. An information carrier as claimed in any preceding claim, wherein the spacing between adjacent detectable elements is measured from the midpoint of one element to the midpoint of the adjacent element.

8. An information carrier as claimed in any preceding claim, wherein said detectable elements are magnetically active elements.

9. An information carrier as claimed in claim 8, wherein said magnetically active detectable elements comprise high permeability, low coercivity material having an easy axis of magnetisation.

10. An information carrier as claimed in any preceding claim, wherein said detectable elements are formed of an optically detectable material.

11. An information carrier as claimed in claim 8 or 9 wherein said the magnetic properties of each of the magnetic elements serves to encode the information carrier.

12. An information carrier as claimed in any preceding claim, wherein the geometric properties of the elements is varied such that the relative dimensions of the elements also serves to encode information .

13. An information carrier as claimed in claim 11 or 12 wherein the magnetic or geometric properties of at least one of the elements is or are known, thereby acting as a reference element, with respect to which, the magnetic or geometric properties of the other detectable elements can be determined when decoding the information carrier

14. An information carrier as claimed in any one of claims 11, 12 or 13, wherein the length of the magnetic elements is varied such that the relative lengths of said magnetic elements also serves to encode information.

15. An information carrier as claimed in any preceding claim, wherein said mathematical sequence is a recurring sequence.

16. An information carrier as claimed in any preceding claim, wherein said substrate comprises a linear strip.

17. An information carrier as claimed in any preceding claim, wherein the series of spaces between the elements are chosen such that the encoded information can be determined irrespective of the direction in which the information carrier is read.

18. An information coding method utilising a plurality of detectable elements supported by, or incorporated in a substrate, the elements being spaced apart from one another such that the series of spaces between the elements encodes the information carrier, characterised in that each of the spaces can be represented by A + mG, wherein A is a first fixed value, G is a second fixed value and m is an integer (which may be zero) the values of which are derived from the integers of a

predetermined mathematical sequence, and wherein the value of A is different to the value of G.

19. An information coding method utilising a plurality of detectable elements supported by, or incorporated in a substrate, the elements being spaced apart from one another such that the series of spaces between the elements encodes the information carrier, characterised in that each of the spaces can be represented by A + mG, wherein A is a first fixed value, G is a second fixed value and m is an integer (which may be zero) the values of which are derived by means of a random number generator, and wherein the value of A is different to the value of G.

20. An information coding method as claimed in claim 18 or 19, wherein the method utilises an information carrier as claimed in any one of claims 3 to 17.

21. An information coding method as claimed in any one of claims 18, 19 or 20, wherein the encoded information is determined by detecting the spacing between each pair of adjacent elements and expressing the spacings as a sequence which maintains the order of spacings on the tag, but commences with the spacing of greatest magnitude, and wherein if there are two or more spacings equal to the greatest magnitude, the starting value of the sequence is selected such that the sequence, if read as a number, would have the highest possible value.

22. An information coding method as claimed in any one of claims 18, 19 or 20 wherein the encoded information is determined by detecting the spacing between adjacent elements when considered in turn along a predetermined path.

23. An information coding method as claimed in claims 18, 19 or 20, wherein the encoded information is determined by the following steps:

i) determining the sequence of spacings between adjacent elements when considered in turn along a first predetermined path;

ii) determining the sequence of spacings between adjacent elements when considered in turn along a second predetermined path which is opposite in direction to the first predetermined path;

iii) selecting one of the sequences of spacings by performing an iterative comparison of successive spacings in each of the paths, the selected sequence being the first one which generates a larger spacing than the other sequence during said iterative comparison; and

iv) decoding the selected sequence to determine the encoded information.